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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/960,398	09/24/2001	Masaki Kurasawa	011254	5650

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WESTERMAN, HATTORI, DANIELS & ADRIAN, LLP
1250 CONNECTICUT AVENUE, NW
SUITE 700
WASHINGTON, DC 20036

EXAMINER	
LE, THAO X	

ART UNIT	PAPER NUMBER
2814	

DATE MAILED: 11/15/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/960,398	KURASAWA ET AL.	
	Examiner	Art Unit	
	Thao X Le	2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 November 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-28,30 and 31* is/are pending in the application.

4a) Of the above claim(s) *15-28* is/are withdrawn from consideration.

5)☒ Claim(s) *1,2,5,6,9,10,13,30 and 31* is/are allowed.

6)☒ Claim(s) *3,4,7,8,11,12 and 14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

2. Claims 3-4, 7-8, 11-12, 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5619393 to Summerfelt et al. in view of US 6294860 to Shimada et al. and US 6265740 to Kim

Regarding to claim 3, Summerfelt discloses a capacitor in fig. 19 comprising: a lower electrode 34 formed on the substrate 30, a capacitor dielectric film 38 formed on the lower electrode 34, and formed of a perovskite ferroelectric material having a smaller thermal expansion coefficient (CTE) than that of the substrate 30, an upper electrode 40 formed on the capacitor dielectric film 38, the lower electrode 34 having a height larger than a width thereof.

But Summerfelt does not expressly disclose a barrier metal layer formed over a substrate and the perovskite ferroelectric material having a crystal oriented substantially perpendicular to a surface of the lower electrode

However, Shimada reference discloses a capacitor structure in fig. 2 comprises a substrate 10, a buffer layer 11/11A, a lower electrode 12, a perovskite ferroelectric (PZT) material having a crystal oriented substantially perpendicular to a surface of the lower electrode, see abstract. At the time the invention was made; it would have been obvious to one of ordinary skill in the art to use the PZT crystal orientation teaching of Shimada in place of Summerfelt's device, because it would have provided a high piezoelectric strain constant and a good adhesion with a lower electrode which can be produced without being cracked as taught by Shimada, see abstract.

With respect to a barrier layer over the substrate, Kim reference discloses a capacitor structure in fig 2, wherein a barrier layer 31 formed over the substrate 21 and a lower electrode 39a formed over the barrier layer 31 and having the width larger than that of the barrier layer 31. At the time the invention was made; it would have been obvious to one of ordinary skill in the art to use the barrier layer teaching of Kim with Summerfelt's device, because it would have prevented a electrode from reacting with the contact plug as taught by Kim, column 3 line 6-8.

With respect to the perovskite ferroelectric material having a smaller thermal expansion coefficient (CTE) than that of the substrate, it is known that Si has the CTE about $3x10^{-6}/C^{o}$, while PZT has the CTE about $1.8x10^{-6}/C^{o}$.

With respect to suppress stress applied to the capacitor dielectric film caused by a CTE difference between the substrate and the capacitor dielectric. This function is obvious in the structure because the when the structure recited in the reference is substantially identical to that of the claims, claimed properties or functions are presumed to be either anticipation or obviousness. *In re Best*, 195 USPQ 430, 433 (CCPA 1977).

Regarding to claim 4, Summerfelt discloses the platinum (Pt) lower electrode 34 and PZT capacitor dielectric 38; therefore the CTE of Pt metal ($9x10^{-6}/C^{o}$) would be larger than that of the PZT ($1.8x10^{-6}/C^{o}$).

Regarding to claims 7-8, 11-12, Summerfelt does not disclose the capacitor wherein the capacitor dielectric film 38 has (001) oriented tetragonal, (110) oriented rhombohedral crystal structure, 0r 9111) oriented rhombohedral crystal structure.

However, Shimada reference discloses the capacitor wherein the capacitor dielectric film 14 has (001) oriented tetragonal and (111) oriented rhombohedral crystal structure, column 4 line 45-52. At the time the invention was made; it would have been obvious to one of ordinary skill in the art to use the PZT crystal orientation teaching of Shimada in place of Summerfelt's device, because it would have provided a high piezoelectric strain constant and a good adhesion with a lower electrode which can be produced without being cracked as taught by Shimada, see abstract.

3. Regarding to claims 14, as discussed in the above claims 3,4, 7-8, 11-12, Summerfelt, Shimada, and Kim disclose all the limitations recited in claim 14, except a semiconductor device comprises a memory cell transistor formed on a semiconductor substrate, and including a gate electrode, and source/drain diffused layers formed in the semiconductor substrate respectively on

both sides of the gate electrode, an insulating film covering the semiconductor substrate with the memory cell transistor formed on.

But Summerfelt and Kim disclose the DRAM application, column 2 line 2 and column 1 lines 15-16, respectively. At the time the invention was made; it would have been obvious to one of ordinary skill in the art to use the teaching of Summerfelt and Kim to form a DRAM or FERAM structure having semiconductor device comprises a memory cell transistor formed on a semiconductor substrate, and including a gate electrode, and source/drain diffused layers formed in the semiconductor substrate respectively on both sides of the gate electrode, an insulating film covering the semiconductor substrate with the memory cell transistor formed on, because such FERAM or DRAM structure is typical in the art, see Cho (6414348), fig. 2D or Ochiai (6043526), fig. 3.

Allowable Subject Matter

4. Claims 1-2, 5-6, 9-10, 13, and 30-31 are allowed because the prior art of record neither anticipated nor rendered obvious all the limitations of the base claim 1 and 13 including the buffer layer structure is formed of an insulating material.

Response to Arguments

5. Applicant's arguments with respect to claim 3-4,7-8, 11-12 and 14 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thao X Le whose telephone number is (571) 272-1708. The examiner can normally be reached on M-F from 8:00 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M Fahmy can be reached on (571) 272 -1705. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Thao X. Le
09 Nov. 2004

LONG PHAM
PRIMARY EXAMINER